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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 10/666,564 | 09/19/2003 | Katherine L. Saenger | YOR90030274US1 | 5537 |

7590 06/30/2006
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EXAMINER

WILLIAMS, ALEXANDER O

ART UNIT PAPER NUMBER

2826

DATE MAILED: 06/30/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/666,564

Applicant(s)

SAENGER ET AL

Examiner

Alexander O. Williams

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 6/5/06.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1, 2, 5-12, 34 and 35 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1, 2, 5-12, 34 and 35 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

Serial Number: 10/666564 Attorney's Docket #: YOR920030274 US1
Filing Date: 9/19/2003;

Applicant: Saenger et al.

Examiner: Alexander Williams

Applicant's Pre-Amendments filed 6/20/06 and 6/9/06 to the election of species I, figures 2a-2h, (claim 1), filed 3/28/05, has been acknowledged. Since this Application is a continuation, claims reading on this elected species will be examined. Claims 1,2 5, 6 34 and 35 read on the elected species. Claims 7-12 appear to not read on the elected species.

Claims 3, 4 and 13-33 have been acknowledged.

Applicant' Drawing replacement filed 6/20/06 has been acknowledged.

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 6/9/06 and 6/20/06 have been entered.

Again, Applicant is reminded of the proper content of an abstract of the disclosure (for example, Applicant's current abstract refers to a method, not the device).

A patent abstract is a concise statement of the technical disclosure of the patent and should include that which is new in the art to which the invention pertains. If the patent is of a basic nature, the entire technical disclosure may be new in the art, and the abstract should be directed to the entire disclosure. If the patent is in the nature of an

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improvement in an old apparatus, process, product, or composition, the abstract should include the technical disclosure of the improvement. In certain patents, particularly those for compounds and compositions, wherein the process for making and/or the use thereof are not obvious, the abstract should set forth a process for making and/or use thereof. If the new technical disclosure involves modifications or alternatives, the abstract should mention by way of example the preferred modification or alternative.

The abstract should not refer to purported merits or speculative applications of the invention and should not compare the invention with the prior art.

Where applicable, the abstract should include the following:

- (1) if a machine or apparatus, its organization and operation;
- (2) if an article, its method of making;
- (3) if a chemical compound, its identity and use;
- (4) if a mixture, its ingredients;
- (5) if a process, the steps.

Extensive mechanical and design details of apparatus should not be given.

Applicant is reminded of the proper language and format for an abstract of the disclosure.

The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words. It is important that the abstract not exceed 150 words in length since the space provided for the abstract on the computer tape used by the printer is limited. The form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc.

The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the claim language of claims 7-12 must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claims 2, 5-12, 34 and 35 are rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claims 2, 5, 6, 34 and 35, the phrase "An interconnect structure according to claim 1" should be --The interconnect structure according to claim 1--.

In claim 2, the phrase "said conductive interconnect and said conductive via" should be consistent with previously claimed language, therefore should read --said conductive interconnect lines and said conducting via--.

In claims 7-12, it is unclear and confusing to what is meant by and what shows the claimed structures in claims 7-12 as they apply to the elected species of figures 2a-2f. Where are the claimed structure detailed to show on the elected species?

Any of claims 2, 5-12, 34 and 35 not specifically addressed above are rejected as being dependent on one or more of the claims which have been specifically objected to above.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.

Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(f) or (g) prior art under 35 U.S.C. 103(a).

Initially, it is noted that the 35 U.S.C. § 103 rejection based on at least the two conductive interconnect lines and at least one conducting via deals with an issue (i.e., the integration of multiple pieces into one piece or conversely, using multiple pieces in replacing a single piece) that has been previously decided by the courts.

In Howard v. Detroit Stove Works 150 U.S. 164 (1893), the Court held, "it involves no invention to cast in one piece an article which has formerly been cast in two pieces and put together...."

In In re Larson 144 USPQ 347 (CCPA 1965), the term "integral" did not define over a multi-piece structure secured as a single unit. More importantly, the court went further and stated, "we are inclined to agree with the solicitor that the use of a one-piece construction instead of the [multi-piece] structure disclosed in Tuttle et al. would be merely a matter of obvious engineering choice" (bracketed material added). The court cited In re Fridolph for support.

In re Fridolph 135 USPQ 319 (CCPA 1962) deals with submitted affidavits relating to this issue. The underlying issue in In re Fridolph was related to the end result of making a multi-piece structure into a one-piece structure. Generally, favorable patentable weight was accorded if the one-piece structure yielded results not expected from the modification of the two-piece structure into a single piece structure.

Claims 1, 2, 5-12, 34 and 35, **insofar as they can be understood**, are rejected under 35 U.S.C. 103(a) as being unpatentable over Cotte et al. (U.S. Patent # 6,346,484 B1).

1. Cotte et al. (figures 1 to 4B) specifically figures 3A-3C show a closed air gap interconnect structure comprising: at least two conductive interconnect lines (right 210 upper portion, left 210), separated by an air gap 310, wherein at least one of said lines (right 210 upper portion) is connected to at least one conducting via (right 220 lower portion in which 230 sits), wherein said lines (right 210 upper portion, left 210) are supported underneath by a plurality of

regions ((left portion of 270 under 210), right 270) made of a robust support dielectric 270 and capped on top by a cap layer 280; said cap layer comprising an array of holes (290, shown in figure 3A), there being a plurality of said holes disposed over said air gap 310.

2. An interconnect structure of according to claim 1, Cotte et al. show wherein said conductive interconnect (lines) **(right 210 upper portion, left 210)** and said conductive (conducting) via **(right 220 lower portion in which 230 sits)** comprise a conductive liner 250 and a conductive fill material 230.

5. An interconnect structure according to claim 1, Cotte et al. show wherein said regions of robust support dielectric form a support plate 200 that lies below said interconnect lines **(right 210 upper portion, left 210)** and encase at least one of said conducting via **(right 220 portion in which 230 sits)**.

6. An interconnecting according to claim 1, Cotte et al. show wherein said holes are closed off with same or different dielectric barrier material **(320, shown in figure 3C)**.

34. An interconnect structure according to claim 1, Cotte et al. show wherein said regions of robust support dielectric form an array of pillars **((left portion of 270 under (right 210 upper portion)), right 270)**.

35. An interconnect structure according to claim 1, Cotte et al. show wherein said regions of robust support dielectric form support beams that lie below said interconnect lines and encases at least one of said conducting via **((left portion of 270 under (right 210 upper portion)), right 270)**.

Therefore, it would have been obvious to one of ordinary skill in the art to use the at least two conductive interconnect lines and the at least one conducting via as "merely a matter of obvious engineering choice" as set forth in the above case law.

Claims 1, 2, 5-12, 34 and 35, **insofar as they can be understood**, are rejected under 35 U.S.C. 103(a) as being unpatentable over Grill et al. (U.S. Patent # 6,413,852 B1).

1. Grill et al. (figures 1A to 5D) specifically figure 4C and 4D show a closed air gap interconnect structure comprising: at least two conductive interconnect lines (right 185 upper portion, left 185), separated by an air gap 190, wherein at least one of said lines (right 185 upper portion) is connected to at least one conducting via (right 185 lower portion in which 182 sits), wherein said lines (right 185 upper portion, left 185) are supported underneath by a plurality of regions ((left portion of 200 under 185), right 200) made of a robust support dielectric 200 and capped on top by a cap layer 460; said cap layer comprising an array of holes (within 460, shown in figure 4D), there being a plurality of said holes disposed over said air gap 310.

2. An interconnect structure of according to claim 1, Grill et al. show wherein said conductive interconnect (lines) **(right 185 upper portion, left 185)** and said conductive (conducting) via **(right 185 lower portion in which 182 sits)** comprise a conductive liner 250 and a conductive fill material 182.

5. An interconnect structure according to claim 1, Grill et al. show wherein said regions of robust support dielectric form a support plate 100 that lies below said interconnect lines **(right**

185 upper portion, left 185) and encase at least one of said conducting via (right 185 portion in which 182 sits).

6. An interconnecting according to claim 1, Grill et al. show wherein said holes are closed off with same or different dielectric barrier material **(460, shown in figure 4D).**

34. An interconnect structure according to claim 1, Grill et al. show wherein said regions of robust support dielectric form an array of pillars **((left portion of 200 under 185), right 200).**

35. An interconnect structure according to claim 1, Grill et al. show wherein said regions of robust support dielectric form support beams that lie below said interconnect lines and encases at least one of said conducting via **((left portion of 200 under 185), right 200).**

Therefore, it would have been obvious to one of ordinary skill in the art to use the at least two conductive interconnect lines and the at least one conducting via as "merely a matter of obvious engineering choice" as set forth in the above case law.

Claims 1, 2, 5-12, 34 and 35, **insofar as they can be understood**, are rejected under 35 U.S.C. 103(a) as being unpatentable over Grill et al. (U.S. Patent # 6,737,725 B1).

1. Grill et al. (figures 1A to 5D) specifically figures 4C and 4D show a closed air gap interconnect structure comprising: at least two conductive interconnect lines (right 185 upper portion, left 185), separated by an air gap 190, wherein at least one of said lines (right 185 upper portion) is connected to at least one

conducting via (right 185 lower portion in which 182 sits), wherein said lines (right 185 upper portion, left 185) are supported underneath by a plurality of regions ((left portion of 200 under 185), right 200) made of a robust support dielectric 200 and capped on top by a cap layer 460; said cap layer comprising an array of holes (within 460, shown in figure 4D), there being a plurality of said holes disposed over said air gap 310.

2. An interconnect structure of according to claim 1, Grill et al. show wherein said conductive interconnect (lines) (right 185 upper portion, left 185) and said conductive (conducting) via (right 185 lower portion in which 182 sits) comprise a conductive liner 250 and a conductive fill material 182.

5. An interconnect structure according to claim 1, Grill et al. show wherein said regions of robust support dielectric form a support plate 100 that lies below said interconnect lines (right 185 upper portion, left 185) and encase at least one of said conducting via (right 185 portion in which 182 sits).

6. An interconnecting according to claim 1, Grill et al. show wherein said holes are closed off with same or different dielectric barrier material (460, shown in figure 4D).

34. An interconnect structure according to claim 1, Grill et al. show wherein said regions of robust support dielectric form an array of pillars ((left portion of 200 under 185), right 200).

35. An interconnect structure according to claim 1, Grill et al. show wherein said regions of robust support dielectric form support beams that lie below said interconnect lines and encases

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at least one of said conducting via ((left portion of 200 under 185), right 200).

Therefore, it would have been obvious to one of ordinary skill in the art to use the at least two conductive interconnect lines and the at least one conducting via as "merely a matter of obvious engineering choice" as set forth in the above case law.

Response

Applicant's arguments filed 6/9/06 have been fully considered, but are moot in view of the new grounds of rejections detailed above.

The listed references are cited as of interest to this application, but not applied at this time.


| Field of Search | Date |
|---|-------------------------------|
| U.S. Class and subclass: 257/774,700,701,758751,760,750,759,522,618,e23.013,e 23.144,e23.167 | 6/11/05 1/11/06 6/25/06 |
| Other Documentation: foreign patents and literature in 257/774,700,701,758751,760,750,759,522,618,e23.013,e 23.144,e23.167 | 6/11/05 1/11/06 6/25/06 |
| Electronic data base(s): U.S. Patents EAST | 6/11/05 1/11/06 6/25/06 |

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alexander O. Williams whose telephone number is (571) 272 1924. The examiner can normally be reached on M-F 6:30-7:00PM.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan Flynn can be reached on (571) 272 1915. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Alexander O Williams
Primary Examiner
Art Unit 2826

AOW
6/26/06